

TOTAL EXTRA PERITONEAL LAPAROSCOPIC HERNIA REPAIR

Thesis

For

Master of Surgery (GENERAL SURGERY)



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JHANSI**

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CERTIFICATE

This is to certify that the work entitled "**TOTAL EXTRAPERITONEAL LAPAROSCOPIC HERNIA REPAIR**" has been carried out by **Dr. Dileep Kumar Suman** himself in this department under my constant supervision and guidance. The results and observations were checked and verified by me from time to time. The technique embodied in this work were undertaken by the candidate himself.

This work fulfills the basic ordinances governing the submission of thesis laid down by Bundelkhand University.

Dated : 2006



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(Guide)

Dedicated
To
My Parents, Friends
&
God

ACKNOWLEDGEMENT

Words fail me in this endeavour of thanking all those luminaries who have lit the path of knowledge for me.

The guiding light during my research work has been Prof. R. Sinha M.S., Head of Department, Department of Surgery, MLB Medical College, Jhansi. I wish to grab this opportunity to express my sincere and heart felt gratitude for providing all the necessary facilities and for giving spared his valuable time for this endeavour. His intellectual fervour, clarity of thought and passion for perfection helped me to launch into a serious study of his topic. It was a honour to work under the master who guided, gave shape & supervised this work into its present form. I would forever be obliged for his timely suggestions, vigilant supervision and above all constant encouragement.

I am thankful to Prof. R. P. Kala M.S., Department of Surgery, M.L.B. Medical College, Jhansi who taught us that excellence never gets over shadowed & who constantly inspired me to perfect the right skills. I am thankful for his valuable advice & unstinting help at every juncture.

For their support & help, I am thankful to my colleagues, Juniors and my friends.

For flawless typing of this manuscript, I am debted to Mr. Rakesh Maurya (New Janta Printers), Sadar Bazar, Jhansi.

Above all I fell highly indebted to my parents and brothers for making every endeavour possible by constantly supporting every little step I dared to take.



Dr. Dileep Kumar Suman

Dated :

CONTENTS

• <i>Introduction</i>	1 - 3
• <i>Review of Literature</i>	4 - 25
• <i>Aims of Study</i>	26
• <i>Material & Methods</i>	27 - 30
• <i>Observation & Results</i>	31 - 35
• <i>Discussion</i>	36 - 42
• <i>Conclusion</i>	43
• <i>Bibliography</i>	44 - 51

Introduction

INTRODUCTION

Modern-day inguinal hernia repair has been dominated by the extraperitoneal groin approach as initially proposed by Bassini in 1884. He revolutionized the treatment of inguinal hernia by introducing the concept of reconstruction of the floor of the inguinal canal. Modifications of his original hernia repair were proposed by, Ferguson¹, McEvedy and McVay² 1940 and Shouldice in 1953³ to avoid testicular complications and to further reduce the postoperative recurrence rate.

Despite these modifications, inguinal herniorrhaphy has not reached perfection. The abundance of literature dealing with various sutures and suturing techniques, prosthetic materials, and herniorrhaphy modification underscore this. In a recent collected series from around the world in which the Bassini repair and variety of its modifications were used to repair inguinal hernias, postoperative recurrence rates varied from 0% to 7% for indirect, to 10% for direct, and 5% to 35% for recurrent hernias.

In addition to recurrence, painful postoperative neuromas, spermatic cord injury, and postoperative epididymitis or orchitis are occasionally seen with the classic extra peritoneal herniorrhaphy using the groin approach. Finally, the conventional operation is painful and is associated with a significant loss of hours on the job, especially when the patient's occupation involves heavy lifting.

In an attempt to further reduce the recurrence rate after inguinal hernia repair, the concept of "tension-free" hernia repair was introduced. Lichtenstein et al⁴ postulated that the prime etiologic basic surgical principle of wound healing. They introduced the tension -free prosthetic hernioplasty that uses prosthetic mesh in groin hernia -free prosthetic hernioplasty that uses prosthetic mesh in groin hernia repair as a substitute for the classic inguinal floor reconstruction.

Cheatle in 1920⁵ introduced Pre-peritoneal repair of hernia. He peeled the peritoneum off the abdominal wall and bladder and was able to transect the sac and repair the internal ring from above. This approach was strongly recommended by Nyhus in 1960 and popularized by his group and by Read, in 1968 and 1979⁶⁻⁸. Stoppa kindled interest in the preperitoneal space mesh placement when he an operation which he calls the giant Prosthesis for reinforcement, where a large sheet of prosthetic mesh is placed between the peritoneum and the abdominal wall to close off all hernial openings.

History of surgery, demonstrates the procedures which are less traumatic, even if more complex, tend to supersede those which involve more pain and trauma, an extension of this preperitoneal repair was approaching this space laparoscopically either transperitoneally or extra peritoneally. Similarly for hernia, Ger et al⁹. proposed the following advantages of laparoscopic repair of a groin hernia.

(1) small puncture wounds

- (3) less chance of injury to the spermatic cord
- (4) decreased incidence of ischaemic orchitis
- (5) decreased incidence of bladder injury
- (6) no ilioinguinal postoperative neuralgia
- (7) outpatient procedure
- (8) ability to achieve a very high closure of the peritoneal sac
- (9) minimal postoperative discomfort
- (10) faster recovery time
- (11) simultaneous intra-abdominal diagnostic laparoscopy and
- (12) ability to diagnose and treat bilateral groin hernias without extensive dissection.

Variation in the repair techniques are currently based upon the approach route and fixation of prosthesis mesh over the defects in the inguinal femoral region. The laparoscopic inguinal herniorraphy can be divided into three approaches :

- 1. Transabdominal Pre-peritoneal repair (TAPP).**
- 2. Extra abdominal Preperitoneal repair or (TEP) Total Extraperitoneal Repair).**
- 3. Intra abdominal peritoneal on-lay patch repair.**

Review
of
Literature

REVIEW OF LITERATURE

EVOLUTION OF HERNIA SURGERY

In the earlier part of first century AD, Celcus described the operation in vogue at that time in the Greco-Roman area¹⁰, Through an incision in the neck of the scrotum, the hernial sac was dissected off the spermatic cord and transected at the external inguinal ring. The testis usually was excised as well. The incision was generally left open. Guy de Chauliac, in 1363, differentiated between inguinal and femoral hernia and described the technique or reduction for strangulation¹¹. In 1556, Franco illustrated the use of a grooved director to cut the strangulated neck of the hernia while avoiding the bowel¹².

Evolution of Herniorrhaphy

Marcy an American surgeon was the first to introduce antiseptic technique in the repair of hernia. He was also the first to recognize the importance of the transversalis fascia and of closing the internal ring. In 1871, he published the report of two patients operated on in the previous year in whom he used carbolized catgut to suture the ring¹³.

The greatest contribution to hernia surgery was that of Italian surgeon Edoardo Bassini¹⁴⁻¹⁸. He realized the importance of repairing the transversalis fascia and of reinforcing the posterior wall of the canal. Using interrupted sutures of silk, he sutured the internal oblique and the transversalis abdominis muscles as well as the upper leaf of the transversalis fascia in one layer to the lower leaf of the transversalis

fascia and the inguinal ligament. Bassini first performed this operation in 1884. During the next 100 years most inguinal hernias were repaired by the Bassini method or variations of it.

Notable among the improvements in this technique was the multilayered repair described by Shouldice in 1953¹⁹. This method has become popular in the past -20 years and is probably the most successful of the pure tissue methods, suturing only the local tissues without the addition of any prosthetic material. However, this method is rather complicated and in some cases, calls for extensive dissection and suturing under tension. Also the technique is difficult and the results are not reproducible by other hernia clinics, leading to a very high recurrence rate outside Shouldice clinic.

Introduction of Mesh in Hernia Surgery

A hernia repair very result of some inherent weakness of the tissues but recurrent Hernia are usually because of ischaemic necrosis of the tissues caused by pressure of sutures under tension. To overcome rather complicated and some cases, calls for these problems, operators have sought the ideal tension less or tension -free repair.

There has already been general agreement that the first step, after dealing with the sac, is to repair the weakened or torn posterior wall of the inguinal canal, the transversalis fascia, and to tighten the stretched internal ring around the cord. This means doing a Marcy type of repair²⁰. Some surgeons have been satisfied with this procedure alone, but others have sought a means of reinforcing the posterior wall

with either natural tissue or biological or synthetic in the form of a tension free darn between the conjoint tendon and the inguinal ligament. The earlier of these Darners was Mc Arthur, who in 1901, reported using pediced strips of the external. Oblique aponeurosis woven between the conjoint tendon and the inguinal ligament²¹.

Later on Moloney introduced the forerunner of modern nylon darn technique in 1948²² with a recurrence rate of less than 1%^[23-24]. This is a tensionless technique in which after dealing with the sac, the posterior wall of the canal is repaired by approximating the rectus sheath and conjoint tendon to the inguinal ligament with a continuous monofilament nylon suture.

Later on surgeons sought sheets of natural tissues as sheets of fascia as free sheets of skin, as reported by Mair, in 1945²⁵, to be sutured to the edges of the posterior wall of the inguinal canal. These methods proved uniformly disappointing with no real progress was made until the development of modern synthetic polymer plastics in the form of sheets of woven or knitted mesh of polyamide and the newer Polypropylene. These were popularized by Usher in 1958²⁶. The threads are monofilament, extensively smooth, and inert and thus elicit less tissue reaction. These synthetic mesh usually were used to strengthen the repair of transversalis fascia to create a strong and tensionless repair.

Modern Herniologist such as Lichtenstein and Gilbert have simply laid a swatch of the synthetic mesh, without sutures, deep to or in front of the repaired fascia transversalis²⁷⁻²⁸.

CLASSIFICATION SYSTEM AND GROIN HERNIA'S

GILBERT CLASSIFICATION WITH ADDITION BY RUTKOW AND ROBBINS⁴⁵

In 1988, Gilbert described a detailed classification system based on anatomic and functional defects established intra operatively, namely the presence or absence of hernia sac, the size and competency of the internal ring, and the integrity of the transversalis fascia -transversus abdominis aponeurosis layer (posterior wall) within Hesselbachs triangle. Incorporating these three components, Gilbert categorized Groin hernias into five classes: Type 1' 2, and 3 were indirect, whereas type 4 and 5 were direct.

In 1993, Rutkow and Robbins expanded on Gilbert's classification scheme. A type 6 was added to encompass those Groin hernias consisting of both direct and indirect components (Pantaloons hernias).

NYHUS CLASSIFICATION : (1991) FOR HERNIA'S

TYPE 1

Are indirect inguinal hernias in which the internal abdominal ring is of normal size, configuration, and structure. The hernial sac can extend from just distal to the internal ring to the middle of the inguinal canal but the area of Hesselbach's triangle remains normal.

TYPE 2

These are indirect inguinal hernias in which the internal sac does not reach the scrotum but may occupy the entire inguinal canal. Nyhus recommends that for type 1, no fascial repair is necessary high ligation of the sac should suffice. Even Nyhus (type 2) in which the internal ring is somewhat dilated, a high ligation is completed, and the ring is simply closed i.e. strengthened with a few interrupted sutures.

TYPE 3

Hernias consist of three subtypes (direct, indirect and formal) and always represent loss of posterior wall integrity.

Type 3A are direct inguinal hernias in which the protrusion represents a weakened transversalis fascia (i.e., area constituting Hesselbach's triangle) bulging outward in front of the hernia with the mass. Every direct hernia, regardless of size or shape of the defect, constitutes a type 3A.

Type 3B are indirect inguinal hernias with a large, dilated ring that has expended medially and encroaches on the inguinal floor. The hernial sac frequently reaches to the scrotum. Occasionally, the cecum on the

right or the sigmoid colon on the left makes up a "sliding" portion of the wall of the sac. Such sliding hernias always destroy a portion of the inguinal floor. In addition, the internal ring may be attenuated with or without displacement of the inferior epigastric vessels.

Occasionally, direct and indirect components of the hernial sac may straddle these vessels to create a pantaloan hernia. Nyhus recommends that for types 3A and 3B, repair be accomplished via either an anterior (e.g. Shouldice (1953)³¹, McVay Cooper (1942)³² ligament, or Condon (1960)³³ (iliopubic tract) or posterior preperitoneal approach. The posterior technique and Condon's iliopubic tract method should include an inlay buttress of mesh to support the anatomic repair.

TYPE 4

Hernias are recurrent defects. They can be direct (type 4A), indirect (type 4B), femoral (type 4C), or a combination of these types (type 4D). They incorporate intricate management problems and carry a higher morbidity than do other hernias. Nyhus recommendation for management of all type 4 hernias is a posterior preperitoneal approach entirely avoids the risk for ilioinguinal or genitofemoral neuralgia reported to occur with anterior approaches.

BENDAVID CLASSIFICATION⁴⁵

In 1993, Bendavid proposed the type, staging, and dimension (TSD) classification scheme. Five types of Groin hernias are described:

- (1) type-1, or anterolateral (formerly, indirect); (2) type-2, or anteromedial (formerly, direct); (3) type-3, or posteromedial (formerly,

femoral); (4) type-4, or posterolateral (formerly, prevascular); and (5) type-5, or anteroposterior (formerly, inguinofemoral). Further, he classified each type in three stages that denote the extent of herniation anatomically.

STOPPA CLASSIFICATION

This is partially derived from NYHUS classification, with special attention to so called 'aggravating factors',

Type-1 is a indirect hernia, with a normal internal ring, measuring less than 2 cm and is most commonly noted in young patients. The inguinal floor is solid.

Type-2 hernias are also indirect, but with the internal ring greater than 2 cm in diameter, although the inguinal floor remains solid.

Type-3 are all indirect and direct inguinal and femoral hernias associated with a weakened inguinal floor, or type-2 hernias are complicated by an aggravating factor.

Type-4 are all recurrent hernias of any type-3s complicated with aggravating factor.

Of the four classification systems presented, in the Nyhus classification the result are easily reproducible.

THE LAPAROSCOPIC HERNIA REPAIR

The history of surgery, demonstrates that the procedures which are less traumatic, even if more complex tends to supersede those which involve more pain and trauma, and we believe laparoscopic

hernia repair will prove such an advance. Laparoscopic groin hernia repair has advantage over open hernia repair as small puncture wounds, minimal dissection, less chance of injury to the spermatic cord and decreased incidence of ischaemic orchitis, decreased incidence of bladder injury, no ilioinguinal postoperative neuralgia, procedure, ability to achieve a very high closure of the peritoneal sac and minimal postoperative discomfort.

The laparoscopic inguinal herniorrhaphy can be divided into three approaches.

- 1. Transabdominal Pre-peritoneal repair (TAPP).**
- 2. Extra abdominal Preperitoneal repair or (TEP) Total Extraperitoneal Repair**
- 3. Intra abdominal peritoneal on-lay patch repair which has now more or less been given up.**

In the 1980s, Lichtenstein and Shulman developed tension-free hernioplasty using a polypropylene mesh implanted anteriorly not only for recurrent hernias, but also for the repair of primary hernias. Using a similar technique, Krischner⁴⁵ had used homologous fascia lata to repair recurrent inguinal hernias as long ago as 1910. The spread of laparoscopic surgery after the establishment of laparoscopic cholecystectomy at the end of the 1880s finally led, in 1990, to the development of transabdominal preperitoneal hernia repair (TAPP), as described by Shultz et al. and Corbitt preperitoneal approach with its advantage of bilateral evaluation and treatment of all existing and

potential inguinal hernial orifices, avoidance of the trauma associated with the transinguinal approach, and safeguarding of healthy tissue structures. The underlying final surgical goal of posterior, open (Stoppa, Wantz, Nyhus) and laparoscopic hernia is the preperitoneal space with reinforcement of the posterior inguinal floor using an alloplastic mesh. Against this background, the establishment of totally extraperitoneal hernioplasty (TEP) by Dulueq [g] in 1991 in Europe and by Mckernan and Laws and Philips et al⁴⁵. In the United States may be considered a logical further development of TAPP or anterior preperitoneal repair.

The TEP procedure combines the advantages of tension-free mesh reinforcement of the grain with those of laparoscopic surgery, with its low postoperative pain and curtailed recovery time while obviating the need for a transabdominal approach.

Among these TEP approach is preferred as no pneumoperitoneum is required. This has the benefit that the initial insufflation is performed without the need for the blind insertion of a Veress needle. This can be a dangerous stage in laparoscopy with the risks of major visceral injury. As the peritoneum is not entered, therefore the dangers of possible intraperitoneal trauma are minimized.

In 1982, under laparoscopic guidance, Ger and colleagues³⁴ used a Michel staple applied with a ocher Clamp to close the peritoneal opening of a hernial sac. These authors saw several potential advantages of laparoscopic hernioplasty, including reduced post-

operative pain, earlier return to activity, and others as described earlier.

The laparoscopic hernia repair can be divided into three approaches.

Transabdominal Pre-peritoneal repair (TAPP)

This is the form of laparoscopic inguinal hernia repair which is routinely performed under general anaesthesia/spinal anaesthesia. After creating a pneumoperitoneum, three ports are introduced, one infraumbilically and two at the level of umbilicus over the staring the surgery.

A horizontal incision is made in the peritoneum over the cephalad aspect of the hernia, followed by dissection of the preperitoneal space, reduction or incision of the sac neck if large, placement of a periperitoneal mesh prosthesis and approximation of the peritoneum with staples.

Lastly inject a long – acting local anesthetic such as bupivacaine into the preperitoneal space before closure, if desired to decrease postoperative pain. Bilateral hernias can be repaired using one long transverse peritoneal incision extending from one anterior superior iliac spine to the other and using a large single piece of mesh.

Intraperitoneal onlay Mesh repair

Advocated by Fitzgibbons and colleagues³⁶ and Franklin³⁷ and later on abandoned by Fitzgibbons because of complications related to possible mesh erosion into bowel.

Total extraperitoneal repair (TEP)

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Among these TEP approach is preferred as no pneumoperitoneum is required. This has the benefit that the initial insufflation is performed without the need for the blind insertion of a Veress needle. This can be a dangerous stage in laparoscopy with the risks of major visceral injury. As the peritoneum is not entered, therefore the dangers of possible intraperitoneal trauma are minimized.

To avoid these complications associated with incision of the peritoneum or intraperitoneal placement of mesh, the surgeons began performing the Stoppa preperitoneal prosthetic mesh repair laparoscopically in 1990³⁸. Here the polypropylene mesh is placed between the underside of the abdominal wall and the peritoneum, fixing the mesh to cooper's ligament and the aponeurotic sling. This type of repair is more technically difficult but is associated with fewer complications and recurrences.

This technique has been most extensively used by Mckernan and Laws⁴⁵, they began the procedure with an incision at umbilicus, identical to that which would be used for open laparoscopy. The fascia at the umbilicus is opened, but the peritoneum is left intact. An open laparoscopic cannula is placed in the incision and an operating laparoscope is used to create a working space between the peritoneum and fascia transversalis.

Philips⁴⁵ from Los Angeles is also a proponent of the totally extraperitoneal procedure. He prefers an initial diagnostic laparoscopy, however, so that he can carefully inspect both sides of the groin to assess the hernias from an intra abdominal viewpoint. He then introduces a Veress needle into the preperitoneal space and under direct vision creates the "pneumoextraperitoneum". A trocar is then placed directly into the preperitoneal space and the pneumoperitoneum is released. The procedure is then similar to Mckernan and laws.

Aregui⁴⁵, one of the pioneers of the TAPP procedure, is now performing almost exclusively totally extraperitoneal laparoscopic hernia repairs.

McKernan and Laws (1993)⁴⁶ extensively used the technique of laparoscopically guided repair of a hernia effect without entering the peritoneal cavity (Totally extraperitoneal). He performed 155 of these repair on 106 patients (69 direct hernias, 85 indirect hernias including 2 sliding), and 1 femoral hernia. The total number of recurrent hernias were 32, and 49 of the hernias were bilateral. They had seen no

recurrences on short term follow-up. Complications included one case of postoperative orchitis, several cases of seromas in the preperitoneal space that responded to aspiration or observation only, five transient testicular swellings, four genitofemoral and four lateral femoral cutaneous neuralgias, one hematoma, one wound infection, and two cases of urinary retention. This procedure had to be converted to TAPP repair, two of them because of the creation of a small hole in the peritoneum and one in a patient who had a previous radical prostatectomy with radiation therapy, which obliterated the preperitoneal space. The average time reported for the operation was 55 minutes.

In a prospective, randomized studies performed by Payne and colleagues (1994)⁴⁷. Lichtenstein type tension free repair were compared with TEP and TAPP repairs. Patients were subjected to carefully designed physical tests and evaluated according to type of hernia, job requirements, and insurance coverage. Post-operative discharge times were similar for all groups. Return to work was significantly earlier in laparoscopic groups. There was one recurrence in each laparoscopic group. Complications were more common following open repair.

Liem MS and Vander Graaf Y et. Al,⁴⁸. Department of surgery Nethereland in 1997 compared the conventional anterior surgery and laparoscopic surgery for inguinal hernia repair. Study was performed on 57 patients who were treated by conventional anterior repair and 487

patients who were treated by extraperitoneal laparoscopic repair. Follow-up of the patients was done after one and six weeks, six months, one and two years. They concluded that patients with inguinal hernias who underwent laparoscopic repair, recover more rapidly and had fewer recurrences than those underwent open surgical repair.

In a prospective, randomized studies performed by Payne and colleagues (1994) 47. Lichtenstein type tension free repair were compared with TEP and TAPP repairs. Patients were subjected to carefully designed physical tests and evaluated according to type of hernia, job requirements, and insurance coverage. Post-operative discharge times were similar for all groups. There was one recurrence in each laparoscopic groups. There was one recurrence in each laparoscopic group. Complications were more common following open repair.

Liem MS and Vander Graaf Y et. Al, 48. Department of Surgery Netherland in 1997 compared the conventional anterior surgery and laparoscopic surgery for inguinal hernia repair. Study was performed on 507 patients who were treated by conventional anterior repair and 487 patients who were treated by extraperitoneal laparoscopic repair. Follow-up of the patients was done after one and six weeks, six months, one and two years. They concluded that patients with inguinal hernias who underwent laparoscopic repair, recover more rapidly and had fewer recurrences than those underwent open surgical repair.

Kozol and colleagues (1997)⁴⁹ performed a randomized, prospective blind comparision of TEP repair and open mesh repair with regards to post-operative pain and the cumulative dosage of analgesia during 48 hrs. In these 62 patients, all of whom had general anaesthesia, postoperative pain was significantly less in those having laparoscopic repairs.

In a prospective, randomized study by Heikkinen and colleagues (1997)⁵⁰ both repairs were performed under general anaesthesia and then compared in relationa to operative time and costs, hospital stay, post-operative pain, return to work and patient satisfaction Differences that reached significance between the two repairs were as follows : Laparoscopic repair had higher costs, resulted in less post-opeative pain and analgesic consumption, allowed patients to retun to work earlier, and had lower complications.

Sudhir kumar et. Al (1999)⁵¹, Department of General Surgery, Western General Hospital NHS Trust, Edinburgh, U.K. presented a paper on 15th May 1998 in which they conducted a prospective study of 50 patients who had laparoscopic TEP repair (n=25) or Lichtenstein repair (n=25) for recurrent inguinal hernia. They conclukded that Laparoscopic repair was associated with fewer complications and a significantly shorter duration of post-operative analgesia than Lichtenstein repair of recurrent inguinal hernia.

W. R. fleming and T. B. Elliot et. Al., 52 (Department of Surgery Melbourne Australia) in 2001 did a randomized clinical trial on 200

patient to compare the totally extraperitoneal inguinal hernia repair with the Shouldice technique. Out of 200 patients 117 patients had TEP repair and 115 patient had shouldice repair. Comparison showed that median operative time was longer for TEP repair but patients were discharged earlier and had a quick return to work and normal life style. Conclusion of the study was that TEP repair results in fewer complications and an earlier return to work and normal life style.

Randomized clinical trial performed on 134 patient by Colak T, and Akca T in 2003⁵³ for the comparision of laparoscopic totally extraperitoneal approach with open mesh repair in inguinal hernia showed that mean operative time, visual analogescale score, hospital stay, and duration of recovery was significantly les for TEP repair in comparision was approximately equal in each group.

A Randomized controlled study was conducted by the Lal P, kajla R. K. et. Al., 54 on the laparoscopic total extraperitoneal and open lichenstein inguinal hernia repair in the department of surgery Maulana Azad Medical College, New Delhi, India in 2003. In a prospective randomized study open hernia repair was performed in one group and TEP repair using a large mesh was performed in another group. The intraoperative and postoperative complications and results were compared. Result of the study showed that mean operative time in TEP group was significantly longer than the open group. The mean pain score in TEP groups was lower than open group. The mean post-operative analgesic dose was lower in the open group. The return to

work time was significantly lower in TEP group in comparision to open group. No recurrence was seen in either of two groups. This study concluded that TEP repair is significantly less painful in the early post-operative period, TEP results in significantly earlier return to work and better cosmetic results.

Brigman S, and Ramel S. et. Al, 56 from center fro surgical sciences, Stockholm, Sweden in 2003 compared the TEP method of inguinal hernia repair with two open tension free hernia repairs (Meshplug and Lichtenstein). In this randomized study hundred Ninety nine men 30 to 75 years old were observed who underwent TEP repair method and open operation. They concluded that most of the patients were discharged within 24 hrs. Post-operative pain was lower in the patients who had a TEP repair. The median time to full recovery was significantly shorter in the TEP group compared to other groups. There were no major complications and equal number of recurrences were found in both group.

C. Tamme and H. Scheidback et. al., (2003)56 from the department of surgery and center for Minimally Invasive Surgery. Hanover hospital, germany, presented a report after performed TEP as the method of choice in more than 92% of all the patients presenting with inguinal hernia, including those with incarcerated, strangulated, or inguinoscrotal hernias, After reduction of the hernial sac and appropriate dissection of the preperitoneal space, they placed a slit-free 10 x 15 cm polypropylene mesh without the use of the staple fixation.

They observed 29 recurrent hernias, which occurred during the first 2 years. During subsequent years, the recurrence rate settled to approximately 0.3%. In the intra-operative complications, eight injuries to the bladder and no bowel injuries or damage to iliac vessels observed. Post operatively single case of mesh infection and bowel obstruction was noticed due to inadequate closure of a peritoneal lesion. They concluded, totally extraperitoneal endoscopic inguinal hernia repair to be a procedure that carried an acceptably low complication rate combining the advantage of minor access surgery and mesh reinforcement of the groin, early post operative return to usual activities and very low recurrence rate.

Bodil Anderson and magnus Hallen et. al., (2003) 57 from the department of surgery. Lund University hospital, Lund Sweden, in a prospective randomized controlled trial designed a study to compare the Laparoscopic extraperitoneal inguinal hernia repair (TEP) with open mesh repair. In this study one hundred sixty-eight men aged 30 to 65 years with primary or recurrent inguinal hernia were randomized to TEP or open mesh technique. 8 patients were randomized to TEP and 87 to open repair for 1 patient in each group, the operation was converted to a different type of repair follow-up was done after 1 week.

Result of the study showed that there was no significant difference seen in overall complications between two groups. However, 1 patient in the TEP group underwent operation for small bowel obstruction after surgery. A higher frequency of post-operative

hematomas were seen in the open group. Patients in the TEP group consumed less analgesic after surgery, returned to work earlier and had a shorter time in full recovery. Two recurrences occurred in the TEP group 1 year after surgery. From the result they concluded that there was less post-operative pain in TEP technique, shorter time to full recovery and an earlier return to work in comparision to open mesh repair.

Haidenberg J, and endrick ML et. al., 58 from the department of surgery. Rochester, U.S.A. in (2003) emphasized on totally extraperitoneal approach for inguinal hernia as they analysed 264 consecutive patient undergoing TEP for inguinal hernia repair. They concluded that totally extraperitoneal approach is a safe and effective method of inguinal hernia repair. They noticed less post operative complications in TEP method for inguinal hernia repair.

H. Scheuerlein, and A. Schiller et. al., (2003)59 performed a prospective single center study on totally extraperitoneal repair recurrent inguinal hernia using data obtained from 179 consecutive patients with recurrent inguinal hernia. Average age of the patients was 56 years and follow-up period of the patients was 2-3 years. Result of the study showed that average operating time was 57 minutes in 68% (104) of the patients, adhesions, afdherent epigastric vessels or cicatrical changes were found, which resulted in the inadvertent opening of the peritoneum in 26.3% of the patients. Intra-operative complications were developed in patients (one injury to the bladder and three cases of

bleeding from side branches of the epigastric vessels). The conversion rate was 0%.

The post-operative complications requiring treatment were hematomas in 7 patients, in 2 patient re-operation became necessary. In both cases haemorrhage was due to pre-operative undiagnosed coagulation disorder was found. No cases of wound or patch infection were observed. From this result they conducted that although for its definitive management, recurrent hernia requires a reliable operative technique but in a representative patient population with recurrent hernia, TEP method to repair recurred inguinal hernia achieves very good results in term of re-recurrence rate (0%), intraoperative and post-operative complications and rehabilitation.

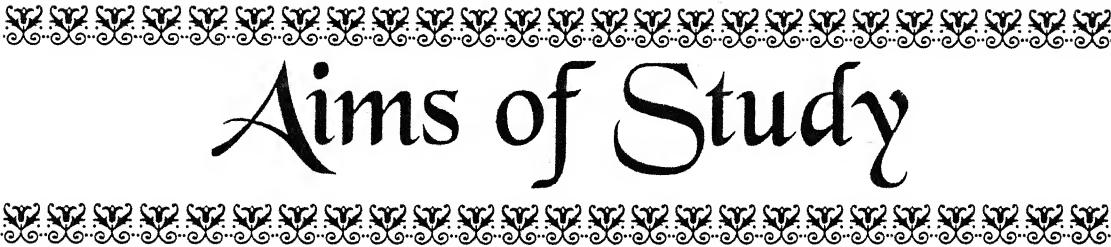
H. Lau and M. G. Patil (2003) 60 evaluated the prevalence and severity of chronic groin pain after endoscopic totally extraperitoneal inguinal hernioplasty. Study was performed on 313 consecutive patients who underwent TEP method for inguinal hernia repair. They resulted that the prevalence of chronic groin pain was 9.2. In more than half of the patients, the groin pain occurred less often than once a month and its duration did not exceed 1 minute. Only one patient reported an impairment of functional activities as a resulting pain. Conclusion of the study renowed that the prevalence of chronic groin pain in patient after TEP was low. The pain was mostly mild and transient without associated sensory symptoms.

E. R. Winslow, M. Quasebarth and L>M. (2004) 61 Brunt from the department of surgery and institute fro Minimally Invasive Surgery, Washington university school of medicine, USA in 2004 collected the data of patients undergoing TEP repair since 1997 (total number of patient – 147) and open mesh repair since 1999 (total number of patient 198) for the study of perioperative outcomes and complications of open and laparoscopic extraperitoneal inguinal hernia repair. Their dates showed that operative times were significantly shorter in the TEP group for both unilateral and bilateral repairs. Patient undergoing TEP repair were more likely to develop urinary retention but were less likely to have skin numbness or prolonged groin discomfort. TEP repairs can be performed efficiently and without major complications.

G. Ferzli K. Shapiro et. al., (2004)62 emphasized on Laparoscopic extraperitoneal approach for acutely incarcerated inguinal hernia repair. Study was done on 16 patients out of which 5 cases were done using a conventional anterior repair and 11 cases had TEP approach. Follow-up of the patients was done for the period of 9 to 69 patients. They concluded that the mean operative time for TEP repair was 50 minutes, and the length of hospital stay was 4-5 days. During a follow-up period, there was no recurrence and the two complications were found.

M. Ghoghesali, H. R. Langeveld, R. Veld Kamp (2005)63, Nethereland emphasizes an laparoscopic hernia repair and concludes that over all cost society for Laparoscopic hernia repair (TEP) is not

higher and in fact may be lower due to lower indirect cost. There is also less likelihood of chronic inguinal pain after endoscopically repaired hernia than open hernia repair. The TEP (endoscopic) approach clearly benefits quality of life, making it a preferred technique from patient perspective.



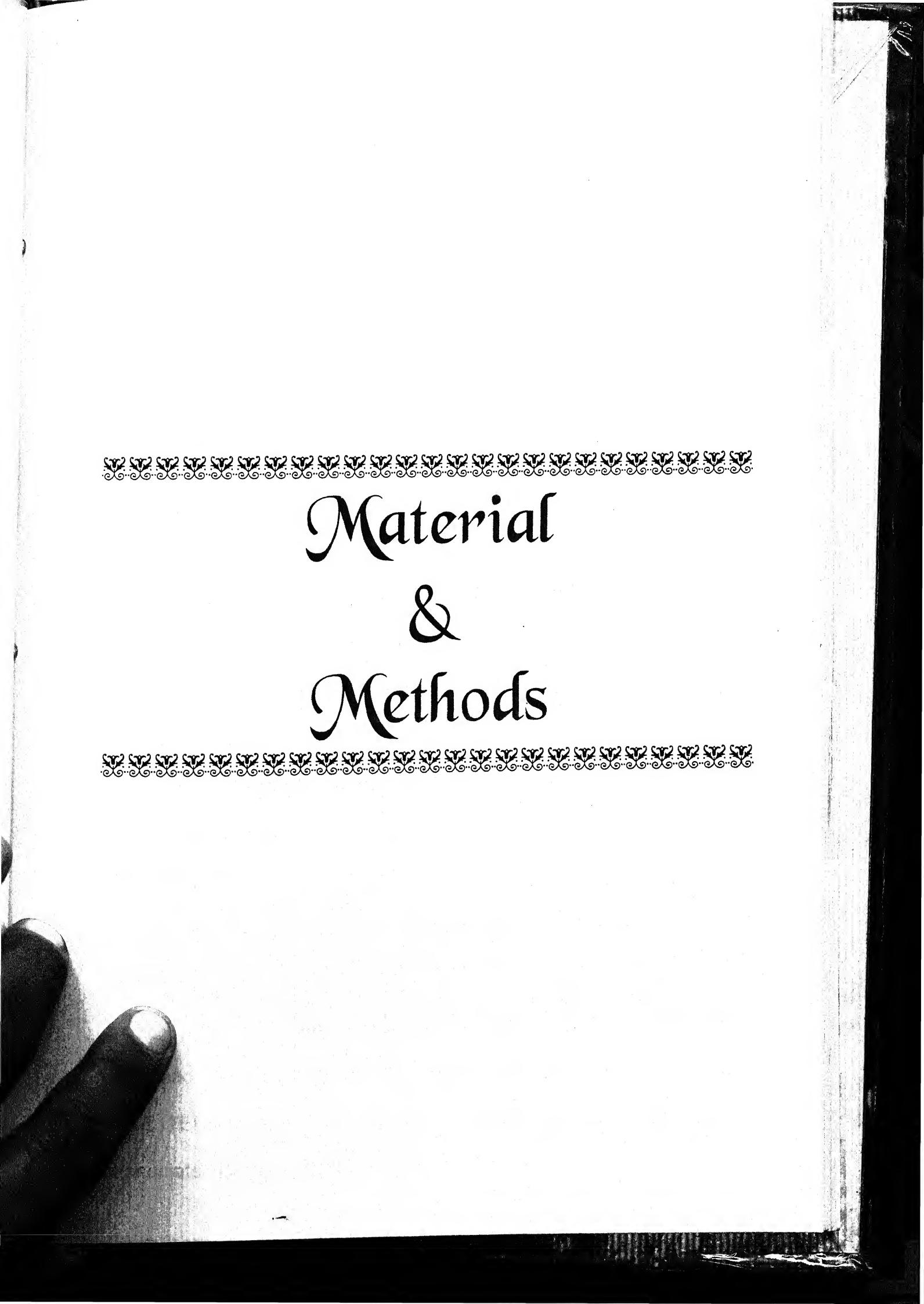
Aims of Study

AIMS OF STUDY

Operative and postoperative parameters of TEP and the changes in these parameters with experience.

Parameters to be show :-

1. Duration of Hospital Stay.
2. Choice of anaesthesia.
3. Operative time.
4. Operative blood loss.
5. Post operative pain relief.
6. Discharge time.
7. Conversion rate.
8. Complications.



Material & Methods

MATERIAL AND METHODS

MATERIAL

The present study will be conducted on patients presenting with inguinal hernia and TEP done on then in the emergency or outpatients department of MLB Medical College, Jhansi in the Department of Surgery over 2 years.

Every patient will have a

- 1) History and Physical examination.
- 2) Appropriate laboratory studies : Complete Haemogram (Hb, TLC, DLC, ESR), Blood Sugar.
- 3) Evaluation of genitourinary system urine routine and microscopic, blood urea, serum creatinine.
- 4) Evaluation of other medical Problems as diabetes, hypertension and tuberculosis.
- 5) Evaluation of cardiac and respiratory systems – ECG and Chest X-ray if needed.

METHOD

The patient is prepared, anaesthetized (General / Spinal and positioned supine on the operating table. No. pneumoperitoneum is required with this technique but precise access to the extra peritoneal plane and insufflations in this layer is crucial to the repair. In most of cases TEP repair are elective but it can be done one patent with strangulated and incarcerated hernias.

A 2 to 3 cm transverse incision is made below the umbilicus. After blunt dissection of the anterior rectus fascia, it is incised transversely over a distance of 2cm on the side of the hernia. In the case of bilateral hernia, we choose the side with the larger hernia or the left side in the event of previous appendectomy. Using a small blunt hook, we open the layer between the rectus muscle anteriorly and the posterior rectus fascia posteriorly by displacing the medial margin of the muscle laterally. A lubricated preperitoneal dissection balloon then is inserted into this plane and advanced along the midline to the pubis.

A **blunt trocar** is inserted below the umbilicus and carbon dioxide (CO₂) is insufflated to 10 mm Hg. Then a 5-mm trocar is introduced approximately 5cm below the umbilicus in the midline. Using a 30°C optic. The peritoneal sac is separated from the transverse abdominal muscle inferiorly and posteriorly to the arcuate line.

The **third trocar** is inserted in the midline below the insertion of second trocar. Once the extraperitoneal dissection has reached the chosen site, the trocar is simply inserted under direct vision in usual fashion. A further blunt ended grasper is inserted through this port, to be used for dissection of the groin. Occasionally, fibers passing from the peritoneum to the back of rectus sheath and transversalis fascia need to be divided with scissors. In the distal part of the dissection, similar fibers from back of rectus muscles and transversalis fascia also need to be divided.

Groin dissection

The groin dissection is carried out by tracing the inferior epigastric vessels towards the deep ring. The upper border of an indirect hernial sac is readily recognized lying lateral to the inferior epigastric vessel. A direct sac lies medially.

As the inguinal region is approached, the upper border of indirect sac is identified. The dissection is continued around the sac to encircle the neck. As the dissection continues medially, the vas can be seen, usually closely related to the sac. On the lateral side the vessels are encountered. Under the neck of the sac, care is needed. The external iliac vessels lie between the vas and the testicular vessels at this point. Once the neck has been encircled and the vas and vessels separated, the sac can be divided. The peritoneum is then dissected free of the structures of the posterior abdominal wall, as in the transperitoneal approach. This part of the dissection needs to continue far enough to allow the mesh to lie flat on the posterior abdominal wall.

Mesh insertion

This is the most important part of the repair and occurs after the hernial defect has been dealt with. The patch must cover all potential hernial defects. A mesh size of 6 x 4 or 6 x 6 cm is used for most of the cases. For insertion the mesh is rolled up like a cigarette and inserted through the umbilical 10mm port. It is either anchored with 2 staples to

the back of the Pubic bone below the evel of femoral and in its upper lateral corner above anterior superior iliac spine or no staple in applied.

After insertion of the mesh, the extraperitoneal plane is deflated and the ports removed. The port sites are closed.

One of the major per-operative complication during TEP repair in our study was Pneumoperitoneum which was mainly due to Peritoneal leak or sometime peritoneal tear. The Pneumoperitoneum was decompressed using veress niddle mild peritoneal tear were left as such without suturing.

Complication of Laparoscopic TEP Herniorraphy

- Recurrence
- Complication
 - Seromas / Hematomas
 - Testicular Swelling / Pain
 - Bleeding
 - Wound infection Urinary retension
 - Post operative pain
 - Hydrocele
 - Enterotomy
 - Cyclolomy
 - Neuralgia



Observation & Results



OBSERVATION AND RESULTS

The present study has been taken at MLB Medical College, Jhansi over a period of 1 year. During this period 22 patients of TEP repair of inguinal hernia were taken in study. While in last year study (from 2004-2005) 26 patients of TEP repair of inguinal Hernia more taken study.

AGE DISTRIBUTION

Range (in years)	2005 – 2006		2004 – 2005	
	No. of Cases	%	No. of Cases	%
10 – 25	2	9.09	01	3.84
26 – 40	4	18.18	06	23.07
41 – 55	10	45.45	11	42.30
56 – 70	4	18.18	05	19.23
71 – 85	2	9.09	03	11.53

Most patients were of age group 41-55 comprising of about 45.45% of total patients 22 in year 2005-2006. While in last year study (2004-2005) It was 42% of total 26 patients.

SEX DISTRIBUTION

Gender	2005 – 2006		2004 - 2005	
	No. of Cases	%	No. of Cases	%
Male	22	100	26	100
Female	0	0	0	0

Among patients included in study, Male were 100% Female were 0%.

TYPES OF INGUINAL HERNIA INCLUDED IN STUDY

Side	2005-2006		2004-2005	
	No	%	No	%
Right	14	63.63	19	72
Left	6	27.27	5	19.4
Bilateral	2	9.09	2	7.6

Type	2005-2006		2004-2005	
	No	%	No	%
Indirect	20	90.90	21	81
Direct	2	9.09	5	19

AVERAGE DURATION OF HOSPITAL STAY (IN DAYS)

Study	Average duration	Maximum	Minimum
2005-2006	3.32	5	2
2004-2006	2.91	6	1

Average duration of stay (in days) in hospital was 3.32 in this study with maximum of 5 days and minimum of 2 day in 22 patients, which was more than that of last year study (2004-2005 year), 2.91 with maximum of 6 days & minimum of 2 day out of 26 patients.

MEAN OPERATIVE TIME – (IN MINUTES)

Study	Mean Operative Time	Maximum	Minimum
2005-2006	44.04	68	35.35
2004-2006	47.0	75	32

Average time in a case of TEP repair was 44.04 minutes in this study with maximum of 68 patients in a bilateral case and minimum of 35 minutes which was less than that last year (2004-2005) study. Average time of TEP repair 47 minutes with maximum of 75 patients in B/L case & minimum of 32 minutes out of 26 patients.

CHOICE OF ANAESTHESIA :

Out of all 22 cases studied – All patient were given spinal anesthesia.

OPERATIVE TECHNIQUE :

Study	Total Case	TEP repair	Conversion of APP
2005-2006	22	20	2
2004-2006	26	24	2

Out of 22 cases studied 20 underwent successful TEP repair while in 2 cases conversion to APP due to large Peritoneal tear. While in last year study 2004-2005, 2 cases lead to APP due to one large peritoneal tear and one due to Haemorrhage out of 26 patients.

AVERAGE NO. OF PAIN KILLERS GIVEN

2005-2006		2004-2005	
No. of Inj.	No. of Tablets	No. of Inj.	No. of Tablets
1.6	4.0	1.8	4.1

MESH SIZE USED :

Size	6"x3"	6"x4"	6"x6"
No. of patients (Study 2005-2006)	None	20	2
No. of patients (Study 2004-2005)	17	6	3

OPERATIVE BLOOD LOSS :

In all cases operative blood loss was minimal except in one case in which there occurred significant bleeding.

COMPLICATION :

PEROPERATIVE

	2005-2006		2004-2005	
	No. of Cases	%	No. of Cases	%
Peritoneal tear	3	13.63	5	19.1
Haemorrhage	1	4.54	1	3.9
Bladder Injury	-	None	-	None
Bowel Injury	-	None	-	None
Damage to iliac vessels	-	None	-	None

IMMEDIATE POST OPERATIVE :

Scrotal Post Operative	2005-2006		2004-2005	
	No. of Cases	%	No. of Cases	%
Scrotal hematoma	1	4.54	1	3.9
Seroma formation	-	None	-	None
Intestinal Obstruction	-	None	-	None

POSTOPERATIVE

	2005-2006		2004-2005	
	No. of Cases	%	No. of Cases	%
Pain referred to lateral side of upper thigh	-	None	1	3.9
Recurrence noted	2	9.09	1	3.9
Post operative Orchitis	-	None	-	None
Infection	-	None	-	None

FOLLOW UP –

One case of persistent pain in lateral aspect of thigh was reported in study after 3 months of follow up in last year study 2004-2005 year.



Discussion

DISCUSSION

Inguinal hernia repair contributes significantly to the general surgeon's work load. Since the evolution of Laparoscopic inguinal hernia repairs, the totally extraperitoneal repair (TEP) is the technique involves the placement of polypropylene mesh in pre-peritoneal space.

This study was done in department of surgery MLB Medical College, Jhansi in year 2005-2006 in which 22 patient of Inguinal hernia were prospectively studied. In all 22 patients undergoing TEP repair 14 were right sided, 6 were left sided and 2 were Bilateral of all 22 cases 20 were indirect and 2 were direct type. While in last year study 2004-2005, 26 patient of inguinal Hernia were prospectivey studied in all 26 patient undergoned TEP repair 19 were right side, 5 were left sde & 25 were B/L of all cases 21 were indirect & 5 were direct type.

Right sided hernia were common comprising of 63.63% of studied patient, and Indirect type was common comprising of 90.90% of all cases. Most patient were of the age group of 41-55 years comprising of about 45.45% of total patients.

Patients were mobilized around 12 hours after the operation and were allowed to go to toilet. Average duration of stay (in days) in hospital was 3.32 day with a maximum of 5 days and minimum of 2 day. While n last study 91 was 2.91 day with maximum of 6 days & minimum of 1 days.

The mean operative time for TEP repair in this study was 44.04 minutes (with maximum of 68 minutes in a bilateral and minimum of 35 minutes. 47.0 minutes & maximum which was less than that of last year study in mean operative time in B/L case 75 min and minimum 32 min. 70 minutes in the study done by W.R. Fleming et.al.⁵², 81 minutes in the study done by Bodil et. al.⁵⁷, 96 minutes in the study done by Haidenberg J et. al. and 75.7 minutes in the study done by Lal P, Kajla R.K. et.al.⁵⁴.

Operative time in open anterior pre-peritoneal repair in a study conducted last year in this department was 22.86 minutes was much lesser than TEP repair.

Table. Showing mean operative time taken in TEP repair and open repair in various study.

Sl. No.	Studies	Time taken (in min)	Open repair
		TEP repair	
1	Mckernan & laws ⁴⁶	55.	-
2	W. R. Fleming et.al. ⁵²	70	-
3	Bodil Anderson et.al. ⁵⁷	81±27	59±20
4	Haidenberg J. et.al. ⁵⁸	96.0	-
5	Lal P, Kajla R.K. et.al. ⁵⁴	75.2±31.6	54±15
6	G. Ferzli K, Shapiro et.al. ⁶²	50	-
7	H. Scheuerlin et.al. ⁵⁹	57.3	-
8	E.R. Winslow et.al. ⁶¹	63±22	72±27
9	G.S. Ferzli K. Shapiro et.al. ⁶²	41	-
10	In a study done in this department last year (2004-2005)	47.0	22.86
11	This study	44.04	

In earlier studies the mean operative time in TEP repair was more as compared to open repair but in recent studies as shown by E.R. Winslow et.al.⁶¹ the time taken in TEP repair (63 ± 22) was less as compared to open repair (71 ± 27) and in study shown by G. S. Ferzli, K. Shapiro et. al, ⁶² the mean operative time in TEP repair was 41 min.

Post operative pain killers given in this study was less in the patient undergoing laparoscopic hernia (TEP repair) as compared to the last year. In this study injection TRAMADOL 50mg I.V. was used. In the patient undergoing TEP repair the average no. of injection was 1.6 and oral tablets in form of Diclofenac was 4.1, which was less than that used in last years study. Various studies have shown that in laparoscopic hernia repair the post operative pain is less as comparative open repair

A randomized controlled study was conducted by the Lal P, Kajla R.K. et. al.,⁵⁴ on the laparoscopic total extraperitoneal and open Lichtenstein inguinal hernia repair in the department of surgery Maulana Azad College, New Delhi, India in 2003. The intraoperative and postoperative complications and results were compared. Result of the study showed that mean operative time in TEP group was shorter than the last year study. The mean post operative analgesic dose was lower than in last year study. The return to work time was significantly lower in TEP group in comparison to open group. No recurrence was seen in either of two groups. This study concluded that TEP repair is significantly less painful in the early post-operative period, TEP results in significantly earlier return to work and better cosmetic results.

In our study out of 22 patients, in 20 patients Mesh Size 6 x 4" was used and in 2 patients mesh size 6 x 6" was used. While in last year study out of 26 patient, 17 patients mesh size 6 x 3" was used, 6 patients mesh size 6 x 4" was used & in 3 patients mesh size 6 x 6" was used.

In our study most of the mesh used was a size of 6 x 4" because in comparision to mesh size 6 x 3" it was easy to staple & not displaced because of bigger size.

Peritoneal tear occurred in 3 cases out of 22 (13.63%)cases studied and was the most common complication occurring peroperatively. In two cases conversion was done and in rest of the cases tear was very small and was left as such after decompressing the pneumoperitoneum using veress needle. In a study conducted by, H Scheurelain, A Schiller et. al⁵⁹ in which peritoneal leak lead to pneumoperitoneum, all were controlled by continuous suture, and in no case conversion was necessary. In another study by W. R. Fleming et. al⁵², there were 12 conversion out of 231 hernia repair in which majority of the case (n=4)were due to peritoneal tear. In another study conducted by G. S. Ferzli, K, Shapiro et. al⁶² in which 804 patients underwent TEP repair, 6 patient had peritoneal tears, in 2 case the tear was closed with vicryl endoloop and in rest 4 cases it was left as such without suturing.

Out of 22 patients studies in our study one patient had scrotal hematoma formation occurred due to injury of spermatic vessels and

was managed conservatively. C. Tamme, H. Schidalbach et. al.⁵⁶, have reported 1.8% incidence of hematoma formation.

Residual neuralgia following herniorrhaphy represents the most vexing complication. The absence of convincing objective tests and the subjective nature of the complaints do not favour an easy resolution to the problem. Essential to understanding the neuralgia is the recognition that the anatomy of the ilioinguinal, iliohypogastric and genitofemoral nerves displays a marked variation that is seldom realized. In a study by Moosman and Oelrich⁶⁴, only 60% of dissection showed a "normal" ilioinguinal nerve. Neuropexia and hyperesthesia have been reported in 15-20% of patients following open hernia repair, whereas chronic pain was seen in 5%.⁶⁵

Four types of neuralgia have been described by Chevrel⁶⁵.

1. Neuroma Pain : The most common type, caused by proliferation of the nerve fibres outside the neurilemma, following complete or partial nerve section. Hyperesthesia is seen along the corresponding dermatome. Pain is exquisite at the site of the neuroma and simulates an electric shock.
2. Deafferentation Pain :- A burning pain following partial or complete nerve section or entrapment in a ligature with chronic paradoxical exacerbations. Initially, an area of anaesthesia is followed by adjacent areas of hyperesthesia, then hyperesthesia and contact dysesthesia in the corresponding dermatome.

3. Projected Pain : The intact nerve is encased in a callus or entrapped in a ligature. Pain is elicited by light touch along the course of the nerve.
4. Referred Pain :- The lesion is at a distance such as an inflammatory granuloma around a suture or the stump of a peritoneal sac.

Laparoscopic herniorrhaphies have brought along a new type of neurologic injury caused by dissection, division of nerves or secondary to stapling of a prosthesis. The nerves in particular are the femoral branch of the genitofemoral nerve and the lateral femoral cutaneous nerves of the thigh. In last year study one patient (3.9%) has complaints of pain radiating in lateral side of thigh possibly due to involvement of lateral cutaneous nerve of thigh.

Two recurrence cases were noted, caused by displacement of the mesh, and were treated by open repair (APP) using the same mesh. While in last year study 1 case seen to recurrence on out of 26 patients post operatively day was noted caused by displacement of mesh.

Endoscopic hernia repair (TEP) has shown to have recurrence rate comparable to open tension free hernia repair reducing the relative risk by 30-50%, over conventional non-mesh procedures. In a study by Fleming W.R.52 2001 there were 5 recurrences out of 115 patients of open repair (Shouldice) and 2 patients out of 117 patients by TEP repair reported with recurrence.

Leim et al⁴⁸ studied 507 cases of open repair and 487 cases of TEP repair out of which in 31 cases of open repair recurrence was noticed while in 17 cases recurrence was noticed after TEP repair..

TEP repair clearly benefits, quality of life, early return to work, less postoperative pain, less chances of recurrences, making it the preferred technique from a patients perspective if high initial costs can be reduced or reimbursed laparoscopic hernia repair TEP should become the procedure of choice.

Conversion :-

In our study conversion from TEP repair to open repair was done in 2 cases out of 22 patients. Percentage being 9.09% the conversion was done due to large peritoneal tear. A study conducted by W.R. Fleming et.al.⁵² in which two hundred patient underwent 231 hernia repair (32 bilateral),the conversion has to be done in 2 patients, percentage being 5%. The reason for conversion was large peritoneal tear (Four). Bleeding (three) Poor Endoscopic view (two) inability to reduced hernia (two) obesity (one).

Conclusion

CONCLUSION

Present study was conducted in department of Surgery M.L.B. Medical College, Jhansi over a period of 1 year including patients undergoing TEP inguinal Hernia repair.

Following Conclusion was drawn the study/

- 1) Majority of cases were seen in age group (41-55) year percentage being 45.45%.
- 2) Male to Female ratio was 100 :0
- 3) Mean operative time in (minutes) was 44.04 minutes.
- 4) Average duration of stay in hospital (in day) was 3.32 days.
- 5) Approximate number of pain killer injection given in the post operative period.

(i)	Injectable	-	1.6
(ii)	In form of oral tablets	-	4.0
- 6) 2 patients in study had occurrence on 7th & 10th post operative days.
- 7) Patients were mobilized at around 12 Hours after operations.
- 8) Average blood loss was minimal in the study.
- 9) Two conversion from TEP to open repair was done in 22 patients percentage being = 9.09%.
- 10) TEP repair results in significantly earlier return to work and better cosmetic results.



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